

# This Type of Therapy Can Save Your Eyes

Analysis by [Dr. Joseph Mercola](#)

✓ Fact Checked

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## STORY AT-A-GLANCE

- › Blue light damages retinal cells responsible for vision color and clarity, but red and near infrared light help recharge retinal mitochondria and improve sight
- › The retina has the highest energy demand of any part of the body. A lack of red and near infrared light from the sun and overexposure to blue light from LED and digital devices can speed retinal aging
- › Artificial light at the wrong time of the day also impacts sleep quality, which is associated with obesity, heart attack, high blood pressure and depression
- › You can lower your exposure to blue light at home by replacing LED with incandescent bulbs and turning down the blue light in your digital devices at 7 p.m. when the sun naturally sets

Vision is one of your five senses and protecting it has an impact on your overall physical and mental health. Your eye is a complex organ that takes in light bouncing off objects in the environment. Structures in the eye bend and change shape so your brain can interpret your surroundings.

Light first enters through the cornea, which is a clear covering over the eye.<sup>1</sup> This functions to protect the eye and to bend the light so it can pass through the dark pupil at the center of your iris, the colored part of the eye. The iris gets larger or smaller, which makes the pupil look smaller or larger, to regulate the amount of light.

Light passes through the lens, which also bends the rays to focus them on the retina at the back of the eye. This structure has tiny light-sensitive nerve cells called cones and rods. The cones are sensitive to color and are in the center of the retina, near the macula.

The rods are sensitive to light intensity and don't register color.<sup>2</sup> They are located outside the macula, extending to the edge of the retina. The cones and rods convert the light into electrical impulses and send them to the brain where your brain perceives an image.

## What Causes Visual Loss?

Visual loss or impairment has an impact on a person's mental and physical well-being. The American Academy of Ophthalmology writes that those with a visual impairment experience a higher risk of some conditions such as depression, social withdrawal and accidents.<sup>3</sup>

People with vision loss may also experience a higher risk of chronic health conditions such as high blood pressure, heart disease, kidney failure, hearing loss and arthritis.<sup>4</sup> As the population ages, the number who have visual impairment or blindness also rises.

The primary causes of visual impairment appear to increase with age. These include cataracts, [age-related macular degeneration](#), glaucoma and diabetic retinopathy.<sup>5</sup> Loss of vision at night may not get as much attention as other eye conditions, but it is commonly found in those who are older.

In some, difficulty seeing at night starts around age 40 and may be associated with older individuals who are involved in car crashes.<sup>6</sup> There are several reasons people may have impaired night vision, including age-related changes and eye disease:<sup>7,8</sup>

**Smaller pupils** — With aging the muscles that control the pupil, the area that allows light into the eye, do not react as quickly or may not be as strong. If the pupil doesn't

dilate enough, you don't have enough light to see. This makes adapting to seeing out the windshield and back to a brightly-lit car dashboard difficult.

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**Eye lens** – With age, the lens of the eye stiffens and may get less transparent. This doesn't let enough light pass through, which you experience especially at night.

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**Rods** – The rods in the retina are necessary for sight but may be lost with aging.

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**Nearsightedness** – This may make it hard to see down the road at night while driving.

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**Medications** – Some can slow your pupil's ability to adapt to changing light conditions.

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**Nutritional deficiency** – A vitamin A deficiency can impair your night vision.

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**Retinitis pigmentosa** – This is a hereditary disease that causes permanent impairment of night vision and peripheral vision. Eventually it can cause significant visual loss in normal light conditions.

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## Recharge Your Eyes With Long Wavelength Light

In the first-of-its-kind research in humans, a team from University College London led by Glen Jeffery was able to improve declining eyesight using simple light therapy.<sup>9</sup> In this short video he describes the interaction between red light and mitochondria, which is the basis for sight improvement.

The researchers were aiming at improving the vision of the large number of seniors who suffer from physical decline and impaired eyesight. In 2020, the team wrote there were 12 million people in the U.K. over age 65, which is expected to increase by another 8 million by 2050.

They estimate all will experience some degree of impairment from aging of the cones and rods in the retina. In the video, Jeffery explains the retina of the eye has a greater energy demand and more mitochondria than other tissues in the body, including the heart. As reported in a press release, he said:<sup>10</sup>

*"As you age your visual system declines significantly, particularly once over 40. Your retinal sensitivity and your colour vision are both gradually undermined, and with an ageing population, this is an increasingly important issue. To try to stem or reverse this decline, we sought to reboot the retina's ageing cells with short bursts of longwave light."*

The team recruited 24 people ages 28 to 72 years. Each of them was given a device that emitted a red light at 670 nanometers. As Jeffery commented, the mitochondria have the ability to absorb light in longer wavelengths, from 650 nm to 1,000 nm to raise energy production.

However, when the wavelength is above 670 the light is difficult for the human eye to see, which could potentially impact compliance. As a result of the high energy demands, the mitochondria in the retina age faster than other areas of the body. This causes a significant reduction in function.<sup>11</sup> The participants took a device home, which they used for three minutes each day for two weeks.

Their rod and cone sensitivity were tested before and after the intervention. They found participants younger than 40 exhibited no difference in sensitivity. However, those older than 40 showed some significant improvement in color contrast and the ability to see in low light. Jeffery concluded:<sup>12</sup>

*"Our study shows that it is possible to significantly improve vision that has declined in aged individuals using simple brief exposures to light wavelengths that recharge the energy system that has declined in the retina cells, rather like re-charging a battery."*

*The technology is simple and very safe, using a deep red light of a specific wavelength, that is absorbed by mitochondria in the retina that supply energy*

*for cellular function. Our devices cost about £12 to make, so the technology is highly accessible to members of the public."*

## **Indoor Living Raises Risk of Light Pollution**

It's important to remember that not all light is the same. In fact, artificial light at the wrong time of the day can significantly impact sleep quality. It's called light pollution and it can result in sleep deprivation that ultimately affects your immune system. There is a steep cost to sleep deprivation, including obesity, high blood pressure, diabetes, heart attack and depression.<sup>13</sup>

One of the side effects of spending hours indoors is a lack of exposure to the sun. The bright light emitted by LED lights and streetlamps is not full-spectrum: Full-spectrum light comes from the sun.<sup>14</sup>

Hormones and bodily functions operate on a circadian rhythm, which is attached to a 24-hour day-night cycle and light. Your hormones that regulate digestion, metabolism and sleep are affected by your circadian rhythm.<sup>15</sup> Ultimately, your circadian rhythm is affected by exposure to sunlight.

For example, the hormone melatonin should rise at night to encourage quality sleep.<sup>16</sup> Exposure to bright sunlight in the morning helps regulate the release of melatonin and affects your sleep cycle. In a recent preprint paper, researchers suggest that lockdowns instigated by COVID-19 have mitigated the protective role of ultraviolet light from the sun by up to 95%.<sup>17</sup>

There is a link between blue light and circadian rhythms.<sup>18</sup> The sun provides a full spectrum of light, and thus includes blue light. A reduction in the intensity of sunlight during the winter months may suppress melatonin and result in feelings of listlessness, sleepiness and in some, depression.

As well as reducing your exposure to full spectrum light, including infrared light from 650 nm to 1000 nm, spending hours indoors increases your exposure to blue light.

Although blue light in the early hours of the day helps shut off melatonin production, continued exposure after sunset has deleterious effects on health.

## **Red Light, Blue Light**

With the production and distribution of energy-efficient LED lights, many are exposed for longer hours to blue light without a balance of red or near-infrared light. For this reason, incandescent lights are safer as they emit the longer wavelength red and near-infrared light and only emit a bit of blue.<sup>19</sup>

The damage blue light does to the retina has been known for years. In one study published in 1995, researchers wrote, “Exposure of the eye to intense light, particularly blue light, can cause irreversible, oxygen dependent damage to the retina.”<sup>20</sup>

More recently, data from a study involving animals has suggested that blue light increases retinal damage and apoptotic cell death. In this study, the damage induced greater cone cell death than rod cell death.<sup>21</sup> The blue light emitted by LED lights is the main component scientists are concerned with regarding vision and the health of the retina.

Experts find that the blue light component in energy-efficient LED lights is “the major cause of retinal damage,” inducing “oxidative stress and retinal injury” as well as “photoreceptor death by necrosis and apoptosis.”<sup>22</sup>

## **How to Use Light at Home**

Researchers from Oregon State University in collaboration with The Ohio State University found prolonged exposure to blue light may also affect your brain, even when blue light is not shining through your eyes.<sup>23</sup>

There are some important steps you can take to protect your eyesight and overall health. While it's important to get blue light first thing in the morning to shut off

melatonin production, it's just as important to reduce exposure after 7 p.m. when the sun naturally begins to set.

There are several ways to accomplish this, depending on your personal preferences. Many digital devices have software that can reduce the blue light emitted by the screen. When you do this on all electronic devices and you replace all LED lights with incandescent bulbs, you won't need blue blocking sunglasses indoors.

However, if you don't have control over lighting, then it's important to strongly consider using blue-blocking glasses after 7 p.m. This will help regulate your internal clock and reduce damage to your eyes.

Outdoor street lighting and alarm clocks are other ways you're exposed to light after dark. The quality of sleep you get is linked to resting in total darkness. Consider removing all light-emitting devices and using a sleep mask and room-darkening blinds.

On the other hand, during the daylight hours, it's important to get sensible sun exposure for eye health and to help raise your vitamin D production. If you find it difficult to fall asleep and stay asleep, you may need to make a few more changes using strategies I suggest in [“Top 33 Tips to Optimize Your Sleep Routine.”](#)

## Sources and References

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- <sup>2</sup> [Stony Brook University](#)
- <sup>3, 5</sup> [American Academy of Ophthalmology](#)
- <sup>4</sup> [Centers for Disease Control and Prevention](#)
- <sup>6, 7</sup> [Drive Safely](#)
- <sup>8</sup> [Cleveland Health Clinic, May 26, 2020](#)
- <sup>9</sup> [The Journals of Gerontology, 2020; doi.org/10.1093/gerona/glaa155](#)
- <sup>10, 12</sup> [EurekAlert! June 28, 2020](#)
- <sup>11</sup> [BGR, July 1, 2020](#)
- <sup>13</sup> [Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem, 2006](#)
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